

RAW SEQUENCE LISTING
PATENT APPLICATION: US/09/744,926

DATE: 05/08/2001
TIME: 11:57:44

Input Set : A:\ES.txt
Output Set: N:\CRF3\05082001\I744926.raw

ENTERED

3 <110> APPLICANT: FROHBERG, Claus
5 <120> TITLE OF INVENTION: NUCLEIC ACID MOLECULES ENCODING AN ALPHA-GLUCOSIDASE, PLANTS WHICH
6 SYNTHESIZE A MODIFIED STARCH, THE GENERATION OF THE PLANTS, THEIR USE, AND THE
7 MODIFIED STARCH
9 <130> FILE REFERENCE: 514413-3865
C--> 11 <140> CURRENT APPLICATION NUMBER: US/09/744,926
C--> 11 <141> CURRENT FILING DATE: 2001-01-30
11 <150> PRIOR APPLICATION NUMBER: PCT/EP99/05536
12 <151> PRIOR FILING DATE: 1999-07-31
14 <150> PRIOR APPLICATION NUMBER: DE 198 36 097.5
15 <151> PRIOR FILING DATE: 1998-07-31
17 <160> NUMBER OF SEQ ID NOS: 2
19 <170> SOFTWARE: PatentIn version 3.0
21 <210> SEQ ID NO: 1
22 <211> LENGTH: 2272
23 <212> TYPE: DNA
24 <213> ORGANISM: Solanum tuberosum
26 <220> FEATURE:
27 <221> NAME/KEY: CDS
28 <222> LOCATION: (135)..(2180)
29 <223> OTHER INFORMATION: coding sequence of alpha-glucosidase
32 <400> SEQUENCE: 1
33 cgaatacgaa taaccgacgc taaccatcaa cgatgggaag tgccggaaga aattctccac 60
35 cgtccaccac cgccgtcgcc gccgtcaacc tccaactcct catcagaaaa ccactcccca 120
37 attaccctct ctaa ccc aaa ctg aga cct aga gtt cac cct tca caa cac 170
38 Pro Lys Leu Arg Pro Arg Val His Pro Ser Gln His
39 1 5 10
41 cat ccc att cag ctt cac cgt ccg ccg gcg ctg cac cgg gga tac tct 218
42 His Pro Ile Gln Leu His Arg Pro Pro Ala Leu His Arg Gly Tyr Ser
43 15 20 25
45 ttt cga tac ttc gcc gga gtt agt cat ggg gtt ttg ctt ctg agt agc 266
46 Phe Arg Tyr Phe Ala Gly Val Ser His Gly Val Leu Leu Leu Ser Ser
47 30 35 40
49 aat ggc atg gat att gtg tat acg ggt gat agg att agt tac aag gtg 314
50 Asn Gly Met Asp Ile Val Tyr Thr Gly Asp Arg Ile Ser Tyr Lys Val
51 45 50 55 60
53 att gga ggg tta att gat ttg tat ttc ttt gcc gga cct tcg ccg gaa 362
54 Ile Gly Gly Leu Ile Asp Leu Tyr Phe Phe Ala Gly Pro Ser Pro Glu
55 65 70 75
57 atg gtg gtg gat cag tat act cag ctt att ggt cgt cct gct gct atg 410
58 Met Val Val Asp Gln Tyr Thr Gln Leu Ile Gly Arg Pro Ala Ala Met
59 80 85 90
61 cca tat tgg tct ttc gga ttt cac caa tgc cgg tgg ggt tac aag aat 458
62 Pro Tyr Trp Ser Phe Gly Phe His Gln Cys Arg Trp Gly Tyr Lys Asn
63 95 100 105
65 att gat gat gtt gaa ctg gta gtg gat agt tat gca aag tct aga ata 506
66 Ile Asp Asp Val Glu Leu Val Val Asp Ser Tyr Ala Lys Ser Arg Ile

RAW SEQUENCE LISTING
PATENT APPLICATION: US/09/744,926

DATE: 05/08/2001
TIME: 11:57:44

Input Set : A:\ES.txt
Output Set: N:\CRF3\05082001\I744926.raw

```

67      110      115      120
69 ccg ctg gag gtt atg tgg act gat att gat tac atg gat ggt ttt aag      554
70 Pro Leu Glu Val Met Trp Thr Asp Ile Asp Tyr Met Asp Gly Phe Lys
71 125      130      135      140
73 gac ttc aca ctc gat cca gtt aac ttc cca ctg gag cgg gta att ttt      602
74 Asp Phe Thr Leu Asp Pro Val Asn Phe Pro Leu Glu Arg Val Ile Phe
75      145      150      155
77 ttt ctc agg aag ctt cat cag aat gat cag aaa tat gta cta ata gta      650
78 Phe Leu Arg Lys Leu His Gln Asn Asp Gln Lys Tyr Val Leu Ile Val
79      160      165      170
81 gat cca gga att agc atc aac aat aca tat gac acc tat agg aga ggc      698
82 Asp Pro Gly Ile Ser Ile Asn Asn Thr Tyr Asp Thr Tyr Arg Arg Gly
83      175      180      185
85 atg gaa gca gat gtc ttc ata aaa cgc gat aat atg ccc tac caa ggg      746
86 Met Glu Ala Asp Val Phe Ile Lys Arg Asp Asn Met Pro Tyr Gln Gly
87      190      195      200
89 gtt gtt tgg cca ggg aat gtt tat tat cct gat ttt cta aat cca gct      794
90 Val Val Trp Pro Gly Asn Val Tyr Tyr Pro Asp Phe Leu Asn Pro Ala
91 205      210      215      220
93 act gaa gta ttt tgg aga aat gaa att gag aag ttc cag gat ctc gta      842
94 Thr Glu Val Phe Trp Arg Asn Glu Ile Glu Lys Phe Gln Asp Leu Val
95      225      230      235
97 cct ttt gat ggc ctg tgg ctt gac atg aat gaa ttg tca aac ttc ata      890
98 Pro Phe Asp Gly Leu Trp Leu Asp Met Asn Glu Leu Ser Asn Phe Ile
99      240      245      250
101 act tcc cct cct aca cca tca tct acc ttt gat gat cct ccc tac aag      938
102 Thr Ser Pro Pro Thr Pro Ser Ser Thr Phe Asp Asp Pro Pro Tyr Lys
103      255      260      265
105 ata aac aac tct ggc gat cac ttg ccc atc aat tat aga aca gtt cca      986
106 Ile Asn Asn Ser Gly Asp His Leu Pro Ile Asn Tyr Arg Thr Val Pro
107      270      275      280
109 gcc act tct aca cat ttt ggt gat aca atg gag tat aat gtc cat aac      1034
110 Ala Thr Ser Thr His Phe Gly Asp Thr Met Glu Tyr Asn Val His Asn
111 285      290      295      300
113 ctt tat gga tta ctt gaa tct aga gcc act tat agt gca ttg gtt aat      1082
114 Leu Tyr Gly Leu Leu Glu Ser Arg Ala Thr Tyr Ser Ala Leu Val Asn
115      305      310      315
117 gtc act ggt aaa agg cca ttc att ctt gta aga tca act ttt ctt ggc      1130
118 Val Thr Gly Lys Arg Pro Phe Ile Leu Val Arg Ser Thr Phe Leu Gly
119      320      325      330
121 tct ggc aga tac acg tca cat tgg act gga gat aat gct gct acc tgg      1178
122 Ser Gly Arg Tyr Thr Ser His Trp Thr Gly Asp Asn Ala Ala Thr Trp
123      335      340      345
125 aac gat ttg gca tac tcc att cct act atc ttg agc ttt gga ttg ttt      1226
126 Asn Asp Leu Ala Tyr Ser Ile Pro Thr Ile Leu Ser Phe Gly Leu Phe
127      350      355      360
129 gga att cca atg gtt gga gct gat ata tgt ggt ttt tca agt aac act      1274
130 Gly Ile Pro Met Val Gly Ala Asp Ile Cys Gly Phe Ser Ser Asn Thr
131 365      370      375      380

```

RAW SEQUENCE LISTING

PATENT APPLICATION: US/09/744,926

DATE: 05/08/2001

TIME: 11:57:44

Input Set : A:\ES.txt

Output Set: N:\CRF3\05082001\1744926.raw

133	act	gaa	gag	ctt	tgc	cgc	cgc	tgg	att	cag	ctt	gga	gca	ttc	tat	cca	1322
134	Thr	Glu	Glu	Leu	Cys	Arg	Arg	Trp	Ile	Gln	Leu	Gly	Ala	Phe	Tyr	Pro	
135					385					390					395		
137	ttt	gca	aga	gac	cac	tct	gct	aag	gac	aca	acc	ccc	caa	gag	ctc	tat	1370
138	Phe	Ala	Arg	Asp	His	Ser	Ala	Lys	Asp	Thr	Thr	Pro	Gln	Glu	Leu	Tyr	
139				400					405					410			
141	agt	tgg	gat	tca	gtt	gct	gca	gca	gcc	aag	aaa	gtc	ctt	ggg	ctc	cga	1418
142	Ser	Trp	Asp	Ser	Val	Ala	Ala	Ala	Lys	Lys	Val	Leu	Gly	Leu	Arg		
143				415					420					425			
145	tat	cag	tta	ctt	cca	tac	ttt	tat	atg	ctt	atg	tac	gag	gca	cat	ata	1466
146	Tyr	Gln	Leu	Leu	Pro	Tyr	Phe	Tyr	Met	Leu	Met	Tyr	Glu	Ala	His	Ile	
147		430					435					440					
149	aaa	ggg	act	ccc	att	gca	cga	ccc	ctc	ttc	ttc	tct	ttc	cct	caa	gat	1514
150	Lys	Gly	Thr	Pro	Ile	Ala	Arg	Pro	Leu	Phe	Phe	Ser	Phe	Pro	Gln	Asp	
151	445				450					455					460		
153	gcc	aag	aca	ttt	gat	atc	agc	aca	cag	ttc	ctt	ctc	ggg	aaa	ggg	gtc	1562
154	Ala	Lys	Thr	Phe	Asp	Ile	Ser	Thr	Gln	Phe	Leu	Leu	Gly	Lys	Gly	Val	
155				465					470					475			
157	atg	atc	tca	cct	ata	ctt	aag	caa	gga	gca	acc	tct	gtt	gat	gca	tat	1610
158	Met	Ile	Ser	Pro	Ile	Leu	Lys	Gln	Gly	Ala	Thr	Ser	Val	Asp	Ala	Tyr	
159				480					485					490			
161	ttc	cct	gct	gga	aac	tgg	ttt	gac	ctc	ttc	aat	tac	tct	cgc	tct	gtg	1658
162	Phe	Pro	Ala	Gly	Asn	Trp	Phe	Asp	Leu	Phe	Asn	Tyr	Ser	Arg	Ser	Val	
163			495					500					505				
165	agt	ttg	aat	caa	gga	aca	tat	atg	aca	ctt	gac	gca	cca	cca	gat	cat	1706
166	Ser	Leu	Asn	Gln	Gly	Thr	Tyr	Met	Thr	Leu	Asp	Ala	Pro	Pro	Asp	His	
167		510					515						520				
169	ata	aat	gta	cat	gtt	cgt	gaa	ggg	aac	ata	ttg	gtc	atg	caa	ggg	gaa	1754
170	Ile	Asn	Val	His	Val	Arg	Glu	Gly	Asn	Ile	Leu	Val	Met	Gln	Gly	Glu	
171	525					530				535					540		
173	gca	atg	aca	aca	caa	gct	gct	cag	agg	act	gca	ttc	aaa	ctc	ctt	gtc	1802
174	Ala	Met	Thr	Thr	Gln	Ala	Ala	Gln	Arg	Thr	Ala	Phe	Lys	Leu	Leu	Val	
175				545					550					555			
177	gtg	ctg	agc	agc	agc	aaa	aac	agc	aca	gga	gaa	cta	ttt	gtg	gac	gat	1850
178	Val	Leu	Ser	Ser	Ser	Lys	Asn	Ser	Thr	Gly	Glu	Leu	Phe	Val	Asp	Asp	
179				560					565					570			
181	gac	gat	gag	gtg	cag	atg	gga	aga	gag	gga	ggg	agg	tgg	acg	cta	gtt	1898
182	Asp	Asp	Glu	Val	Gln	Met	Gly	Arg	Glu	Gly	Gly	Arg	Trp	Thr	Leu	Val	
183			575					580						585			
185	aag	ttt	aac	agc	aat	atc	att	ggc	aat	aaa	att	gtg	gtt	aaa	tca	gag	1946
186	Lys	Phe	Asn	Ser	Asn	Ile	Ile	Gly	Asn	Lys	Ile	Val	Val	Lys	Ser	Glu	
187		590					595					600					
189	gtt	gtg	aat	gga	cga	tat	gcg	ctg	gat	caa	gga	ttg	gtc	ctt	gaa	aag	1994
190	Val	Val	Asn	Gly	Arg	Tyr	Ala	Leu	Asp	Gln	Gly	Leu	Val	Leu	Glu	Lys	
191	605					610					615				620		
193	gtg	aca	tta	ttg	gga	ttt	gaa	aat	gtg	aga	gga	ttg	aag	agc	tat	gag	2042
194	Val	Thr	Leu	Leu	Gly	Phe	Glu	Asn	Val	Arg	Gly	Leu	Lys	Ser	Tyr	Glu	
195				625					630					635			
197	ctt	gtt	gga	tca	cac	cag	caa	ggg	aac	aca	aca	atg	aag	gaa	agt	ctt	2090

RAW SEQUENCE LISTING

PATENT APPLICATION: US/09/744,926

DATE: 05/08/2001

TIME: 11:57:44

Input Set : A:\ES.txt

Output Set: N:\CRF3\05082001\I744926.raw

```

198 Leu Val Gly Ser His Gln Gln Gly Asn Thr Thr Met Lys Glu Ser Leu
199          640          645          650
201 aag cag agt gga cag ttt gtt act atg gaa atc tca ggg atg tca ata      2138
202 Lys Gln Ser Gly Gln Phe Val Thr Met Glu Ile Ser Gly Met Ser Ile
203          655          660          665
205 ttg ata ggg aaa gag ttc aaa ttg gag cta tac atc att act      2180
206 Leu Ile Gly Lys Glu Phe Lys Leu Glu Leu Tyr Ile Ile Thr
207          670          675          680
209 taacaaatga attaagttat atacgcttgt tgtatgaaat tttctttcat ttatcaatgc      2240
211 agtttaattt atgataaaaa aaaaaaaaaa aa      2272
214 <210> SEQ ID NO: 2
215 <211> LENGTH: 682
216 <212> TYPE: PRT
217 <213> ORGANISM: Solanum tuberosum
219 <400> SEQUENCE: 2
221 Pro Lys Leu Arg Pro Arg Val His Pro Ser Gln His His Pro Ile Gln
222 1          5          10          15
225 Leu His Arg Pro Pro Ala Leu His Arg Gly Tyr Ser Phe Arg Tyr Phe
226          20          25          30
229 Ala Gly Val Ser His Gly Val Leu Leu Ser Ser Asn Gly Met Asp
230          35          40          45
233 Ile Val Tyr Thr Gly Asp Arg Ile Ser Tyr Lys Val Ile Gly Gly Leu
234          50          55          60
237 Ile Asp Leu Tyr Phe Phe Ala Gly Pro Ser Pro Glu Met Val Val Asp
238 65          70          75          80
241 Gln Tyr Thr Gln Leu Ile Gly Arg Pro Ala Ala Met Pro Tyr Trp Ser
242          85          90          95
245 Phe Gly Phe His Gln Cys Arg Trp Gly Tyr Lys Asn Ile Asp Asp Val
246          100          105          110
249 Glu Leu Val Val Asp Ser Tyr Ala Lys Ser Arg Ile Pro Leu Glu Val
250          115          120          125
253 Met Trp Thr Asp Ile Asp Tyr Met Asp Gly Phe Lys Asp Phe Thr Leu
254          130          135          140
257 Asp Pro Val Asn Phe Pro Leu Glu Arg Val Ile Phe Phe Leu Arg Lys
258 145          150          155          160
261 Leu His Gln Asn Asp Gln Lys Tyr Val Leu Ile Val Asp Pro Gly Ile
262          165          170          175
265 Ser Ile Asn Asn Thr Tyr Asp Thr Tyr Arg Arg Gly Met Glu Ala Asp
266          180          185          190
269 Val Phe Ile Lys Arg Asp Asn Met Pro Tyr Gln Gly Val Val Trp Pro
270          195          200          205
273 Gly Asn Val Tyr Tyr Pro Asp Phe Leu Asn Pro Ala Thr Glu Val Phe
274          210          215          220
277 Trp Arg Asn Glu Ile Glu Lys Phe Gln Asp Leu Val Pro Phe Asp Gly
278 225          230          235          240
281 Leu Trp Leu Asp Met Asn Glu Leu Ser Asn Phe Ile Thr Ser Pro Pro
282          245          250          255
285 Thr Pro Ser Ser Thr Phe Asp Asp Pro Pro Tyr Lys Ile Asn Asn Ser
286          260          265          270

```

RAW SEQUENCE LISTING

PATENT APPLICATION: US/09/744,926

DATE: 05/08/2001

TIME: 11:57:44

Input Set : A:\ES.txt

Output Set: N:\CRF3\05082001\I744926.raw

```

289 Gly Asp His Leu Pro Ile Asn Tyr Arg Thr Val Pro Ala Thr Ser Thr
290      275      280      285
293 His Phe Gly Asp Thr Met Glu Tyr Asn Val His Asn Leu Tyr Gly Leu
294      290      295      300
297 Leu Glu Ser Arg Ala Thr Tyr Ser Ala Leu Val Asn Val Thr Gly Lys
298 305      310      315      320
301 Arg Pro Phe Ile Leu Val Arg Ser Thr Phe Leu Gly Ser Gly Arg Tyr
302      325      330      335
305 Thr Ser His Trp Thr Gly Asp Asn Ala Ala Thr Trp Asn Asp Leu Ala
306      340      345      350
309 Tyr Ser Ile Pro Thr Ile Leu Ser Phe Gly Leu Phe Gly Ile Pro Met
310      355      360      365
313 Val Gly Ala Asp Ile Cys Gly Phe Ser Ser Asn Thr Thr Glu Glu Leu
314      370      375      380
317 Cys Arg Arg Trp Ile Gln Leu Gly Ala Phe Tyr Pro Phe Ala Arg Asp
318 385      390      395      400
321 His Ser Ala Lys Asp Thr Thr Pro Gln Glu Leu Tyr Ser Trp Asp Ser
322      405      410      415
325 Val Ala Ala Ala Ala Lys Lys Val Leu Gly Leu Arg Tyr Gln Leu Leu
326      420      425      430
329 Pro Tyr Phe Tyr Met Leu Met Tyr Glu Ala His Ile Lys Gly Thr Pro
330      435      440      445
333 Ile Ala Arg Pro Leu Phe Phe Ser Phe Pro Gln Asp Ala Lys Thr Phe
334      450      455      460
337 Asp Ile Ser Thr Gln Phe Leu Leu Gly Lys Gly Val Met Ile Ser Pro
338 465      470      475      480
341 Ile Leu Lys Gln Gly Ala Thr Ser Val Asp Ala Tyr Phe Pro Ala Gly
342      485      490      495
345 Asn Trp Phe Asp Leu Phe Asn Tyr Ser Arg Ser Val Ser Leu Asn Gln
346      500      505      510
349 Gly Thr Tyr Met Thr Leu Asp Ala Pro Pro Asp His Ile Asn Val His
350      515      520      525
353 Val Arg Glu Gly Asn Ile Leu Val Met Gln Gly Glu Ala Met Thr Thr
354      530      535      540
357 Gln Ala Ala Gln Arg Thr Ala Phe Lys Leu Leu Val Val Leu Ser Ser
358 545      550      555      560
361 Ser Lys Asn Ser Thr Gly Glu Leu Phe Val Asp Asp Asp Asp Glu Val
362      565      570      575
365 Gln Met Gly Arg Glu Gly Gly Arg Trp Thr Leu Val Lys Phe Asn Ser
366      580      585      590
369 Asn Ile Ile Gly Asn Lys Ile Val Val Lys Ser Glu Val Val Asn Gly
370      595      600      605
373 Arg Tyr Ala Leu Asp Gln Gly Leu Val Leu Glu Lys Val Thr Leu Leu
374      610      615      620
377 Gly Phe Glu Asn Val Arg Gly Leu Lys Ser Tyr Glu Leu Val Gly Ser
378 625      630      635      640
381 His Gln Gln Gly Asn Thr Thr Met Lys Glu Ser Leu Lys Gln Ser Gly
382      645      650      655
385 Gln Phe Val Thr Met Glu Ile Ser Gly Met Ser Ile Leu Ile Gly Lys

```

VERIFICATION SUMMARY DATE: 05/08/2001
PATENT APPLICATION: US/09/744,926 TIME: 11:57:45

Input Set : A:\ES.txt
Output Set: N:\CRF3\05082001\I744926.raw

L:11 M:270 C: Current Application Number differs, Replaced Current Application No
L:11 M:271 C: Current Filing Date differs, Replaced Current Filing Date